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WHAT CAN BE DONE IN DESTROYING THE COTTON BOLL WEEVIL DURING THE WINTER.

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IMPORTANCE OF WINTER WORK.

The boll weevil attracts greatest attention during the growing season of cotton, for the simple reason that its damage is then most evident. When the infested squares are falling by millions every day the planter is driven to most strenuous efforts to check the loss. The summer season, however, is the one in which it is most difficult to combat the weevil. The pest can be attacked in various ways at different seasons of the year. This circular attempts to point out what can be done in the winter when the weevils are in hibernating quarters and when natural conditions are assisting the farmer greatly by reducing the number that will be able to survive until spring. At this time the farmer can undoubtedly accomplish more than by hand-picking weevils and squares or any other direct method of control that can be put into operation in the summer season. A great advantage that winter work has in many cases is that it involves no special outlay and consequently adds nothing to the cost of producing cotton. The work can be done during the quiet period of the winter and at such times as will not interfere with the general work of the plantation. Even on plantations run largely or entirely by "wages hands" this work would undoubtedly warrant an outlay on the part of the planter. As a matter of fact the winter season could well be made the most active of the year as far as the destruction of the weevil is concerned.

It is true that the Texas farmers have not paid much attention to work against the weevil in the winter, but this does not by any means indicate that such work will not be of prime importance to the planters in Louisiana and Mississippi. Nature has afforded the Texas farmer many advantages over the planter in the eastern part of the cotton belt. As has been pointed out in other publications of the Bureau of Entomology, the Mississippi Valley planter will be compelled to contend against many more weevils each spring than the climatic conditions in Texas have ever permitted to survive. For instance, in the spring of 1908 it was determined by Mr. Wilmon Newell, secretary of the State crop pest commission of Louisiana, that as many as 6,000 hibernated weevils per acre made their appearance in certain cotton fields in Avoyelles Parish, Louisiana. This shows a survival of weevils far beyond what has ever been found in Texas. There are many other indications of the special seriousness of the weevil problem in the Mississippi Val-

ley. All this demonstrates that the planters in regions recently invaded by the weevil must resort to every means of control that is known and must utilize to the fullest extent such methods as the Texas farmers may not have been compelled to practice.

The all-important step in the control of the weevil is the destruction of millions of individuals and the prevention of the development of many more by uprooting and burning the cotton plants in the fall. This is a step that indications show clearly is going to be indispensable in the Mississippi Valley. In the light of what is now known it would be folly for planters to attempt to produce cotton unless they follow this practice religiously. If, for any reason, the cotton plants have not been removed in the fall, some good can be accomplished by their removal later in the season. The proper thing to be done by the planter who desires to reduce weevil damage to the minimum is to combine the fall destruction of the plants with such measures, to be taken later in the season, as are outlined in this circular. *The advice now given is not to depend upon winter work altogether for the control of the weevil. The winter work is merely a second step, to be taken in connection with the destruction of the weevils and the prevention of the maturity of the fall broods by uprooting and burning the plants. Where that step has not been taken, the work outlined in this circular is the main dependence of the planters at this time.*

WHERE WEEVILS ARE TO BE FOUND DURING THE WINTER.

The whole question of what can be done to destroy the weevils in the winter depends upon where they are to be found. The Bureau of Entomology has taken pains to determine the localities in which the weevils secrete themselves during the winter months. Some weevils fly outside of the cotton fields into the timber before frost has killed the cotton. Of course, such individuals as fly great distances from the cotton fields, or into heavy timber, are entirely beyond the reach of the planter. The remainder of the weevils, however—those remaining in and about the cotton fields—are more or less at the mercy of the planter for several months during the winter.

In cotton fields and in their immediate vicinity weevils have been found hibernating in four principal situations: *First*, in burrs and unopened bolls on the plants; *second*, in bolls or portions of bolls that have been knocked to the ground; *third*, under such trash as leaves and grass abounding in most cotton fields; *fourth*, in the cracks in the ground caused by drying.

The numbers of weevils found in the situations just mentioned show clearly what opportunities the farmer has for their destruction. On January 16, 1907, a field near Wolfe City, Tex., showed from 363 to 1,500 live weevils per acre in the burrs still hanging to the plants. These were generally in the partly opened locks where weevils had matured in the fall, but some were in locks from which all of the cotton had been removed. On January 27, 1907, as many as 2,250 weevils per acre were found on the ground in a cotton field near Dallas, Tex. The number was determined by raking all of the trash carefully from a square rod of ground and examining it in the laboratory. On December 18 living weevils at the rate of 1,056 per acre were found at Dallas. On January 16 320 living weevils per acre were found in burrs and under leaves and grass in a cotton field at Victoria, Tex. On Novem-

ber 15 4 weevils were found in the cracks around the bases of 22 cotton plants growing near Dallas. This indicates a total number of weevils per acre in such situations in this field of 1,090.

Practically all of the weevils to be found in the situations described can be killed by raking and burning the trash, except those in cracks in the ground, and these, in the majority of cases, would probably be crushed by winter plowing of the fields.

PLOWING NOT EFFECTIVE.

The point may be raised that winter plowing, by burying the weevils found in trash on the surface, might have the same effect as burning. On the contrary, experiments have shown that weevils can easily make their way through several inches of soil. Consequently such work in general is as likely to protect as to destroy the weevils. Of course, if heavy rains should follow immediately after plowing, it is possible that some soils would be so compacted as to prevent the emergence of weevils. Nevertheless, this could not happen under usual conditions. In the case of weevils in cracks, destruction would not result from burial but from crushing.

What has just been stated should not be taken to mean that winter plowing should not be followed. As a matter of fact, the winter working of the fields should be practiced, not only on general principles, but to assist in procuring an early crop. The present purpose is merely to point out how to destroy the boll weevil in the winter. Regardless of its other benefits, winter plowing can not be depended upon to actually kill many weevils.

WEEVILS THAT CAN BE REACHED OUTSIDE OF COTTON FIELDS.

In addition to those in the cotton fields themselves, many weevils can be reached that have found winter quarters along turn-rows, in ditches, along fences, and in the trash that is frequently allowed to accumulate around seed houses. Fire is again the agent of destruction at the command of the farmer. Careful burning of turn-rows and ditches and cleaning of fence corners and similar situations will result in the death of many weevils that might survive to damage the crop of the following season.

The work of burning and cleaning the plantation should not stop with the immediate vicinity of cotton fields. Many weevils fly into corn fields, where they find suitable quarters for passing the winter. These fields, on a cotton plantation, should be cleaned during the winter as thoroughly as the fields where cotton has been growing or is to be grown during the next season. It has been found that sorghum fields furnish exceptionally favorable opportunities for hibernating weevils. The heavy stubble left by this crop catches grass and general débris blown about by the wind, which then becomes heavily matted. Here many weevils are to be found during the winter. In many cases in Texas the earliest appearing weevils and the greatest damage to the crop have been shown to be chargeable to neighboring sorghum fields which have served as winter quarters for the pest.

Many weevils undoubtedly find hibernating quarters in trash along railroad rights of way as well as along wagon roads. The importance of such means furnished the weevil for passing the winter becomes great where, as in many cases, the roads or railroads pass through localities

where cotton fields adjoin the public property. It should be the duty of railroad and county authorities in such cases to assist the farmers as far as practicable by removing the shelter for the weevil.

WEEVILS IN COTTON SEED.

Cotton seed has frequently been supposed to furnish exceptionally favorable winter quarters for the weevil. It has been shown that many weevils pass through the gins and are later to be found in the bulk cotton seed in storage. Up to a certain time in the winter cotton seed is very likely to contain live weevils. Many experiments, however, have shown that very few are able to survive in this medium until spring. This seems to be due principally to the absence of moisture. Repeatedly numbers of weevils have been placed in cotton seed in the fall. Altogether 6,600 weevils have been used in these experiments. They were placed under a variety of conditions. Although many have survived until the middle of winter, only two lived until the first of April. It is therefore clear that cotton seed itself is not an especially dangerous commodity. Although it is true that the earliest weevils frequently make their appearance in the vicinity of seed houses, this is to be accounted for by the fact that the insects find quarters under the building and under the trash that is allowed to accumulate in such situations rather than in the cotton seed itself.

CONCLUSION.

The climatic and labor conditions surrounding cotton production in Louisiana and Mississippi leave no doubt that the planters in those States must not overlook any important means of controlling the boll weevil. *This circular points out one important and inexpensive means that can be practiced by every planter.* It is of special importance in the humid regions recently invaded where fears of disaster are now commonly entertained. The Department of Agriculture urges that cotton raisers take advantage of the enemy while they have the opportunity and by the means herein described greatly increase the chances for producing a crop the coming season.

Approved:

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *December 19, 1908.*

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